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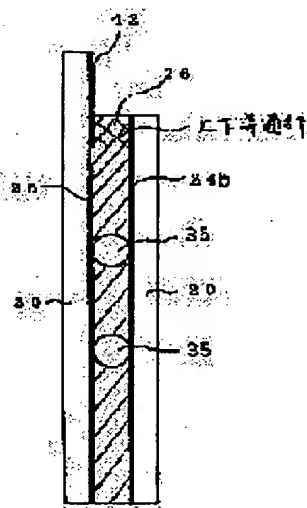
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(54) LIQUID CRYSTAL DISPLAY DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To prevent the occurrence of display density unevenness by conductively bringing into contact at least a part of a laying electrode of a common electrode provided on an inside surface of a second substrate with a current path increasing electrode provided on the inside surface of a first substrate through seal material containing conductive material.

SOLUTION: The laying electrode 24b of the common electrode provided on the inside surface of the second substrate 20 is constituted so as to come into contact with the current path increasing electrode 25 provided on the inside surface of the first substrate 30 through the seal material 26 containing the conductive material. In such a manner, even when the laying electrode 24b is long in e.g. its length, and its wiring resistance value of the laying electrode 24b itself is large, by electrically bringing into contact it with the seal material 26 containing the conductive material and the current path increasing electrode 25, and making them one electrode, the wiring resistance value is reduced. Then, a transmission light quantity is controlled by a voltage applied between a segment electrode and the common electrode opposite to each other.



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CLAIMS

[Claim(s)]

[Claim 1] The 1st substrate which equipped the inside surface with a segment electrode, and an object for segment electrodes and an external drawer electrode for common electrodes, The 2nd substrate which it lengthened about for [which is electrically connected to a common electrode and a common electrode on the inside surface] common electrodes, and was equipped with an electrode In a liquid crystal display which controls the amount of transmitted lights by voltage which pastes up through a sealant, sandwiches liquid crystal between the 1st substrate and the 2nd substrate, and is impressed between segment electrodes and common electrodes which counter It lengthens about. a conductive material contains in said sealant -- having -- **** -- moreover -- said -- some electrodes [at least] It extends along with a portion on the 2nd substrate which said sealant pastes up. To said 1st substrate Lengthen about and it makes said a part of said 2nd substrate up [at least] which is an electrode counter in the inside surface. An electrode for the increment in current pass is further formed in a portion which said sealant pastes up, and a common electrode prepared in the inside surface of the 2nd substrate lengthens about. Some electrodes [at least] A liquid crystal display characterized by being constituted so that electric conduction contact may be carried out through a sealant containing a conductive material with an electrode for the increment in current pass prepared in the inside surface of the 1st substrate.

[Claim 2] It is the liquid crystal display characterized by said thing [that lengthen about and some patterns of an electrode are prepared in a sealant] in a liquid crystal display according to claim 1.

[Claim 3] It is the liquid crystal display characterized by lengthening about and connecting an electrode to an external drawer electrode currently formed in the 1st substrate through a sealant containing a conductive material currently formed in said 2nd substrate, and an electric target in a liquid crystal display according to claim 1 or 2.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] The 1st substrate with which this invention equipped the inside surface with the segment electrode (signal lateral electrode), and the object for segment electrodes and the external drawer electrode for common electrodes, For example, it sets in the periphery section of these substrates. the 2nd substrate which it lengthened about for [which is electrically connected to a common electrode (scan electrode) and a common electrode on the inside surface] common electrodes, and was equipped with the electrode -- It pastes up through a sealant and is related with the liquid crystal display (liquid crystal display element) which controls the amount of transmitted lights by voltage impressed between the segment electrodes and common electrodes which sandwich liquid crystal between the 1st substrate and the 2nd substrate, and counter it.

[0002]

[Description of the Prior Art] In recent years, the liquid crystal display element (liquid crystal display) attracts attention as a display used as the man machine interface in pocket devices, such as PDA (Personal Digital Assistant) and a cellular phone. The outline plan in which drawing 5 shows an example of this kind of liquid crystal display element (liquid crystal display), and drawing 6 are the cross sections in the B-B line of drawing 5.

[0003] Reference of drawing 5 and drawing 6 constitutes this liquid crystal display as what the 1st substrate 30 which equipped the inside surface with the segment electrode (signal lateral electrode) 32, and the 2nd substrate 20 which equipped the inside surface with the common electrode (scan electrode; common side display electrode) 22 pasted up by the sealant 26 in the periphery section inside these substrates 20 and 30.

[0004] That is, the circuit pattern of the stripe-like ITO electrode 32 is formed in the inside surface of the 1st substrate 30 as a segment electrode, and these segment electrode 32 was prolonged straightly and exposed as a wiring electrode 43 for external drawers with a part of 1st substrate 30. Moreover, the circuit pattern of the stripe-like ITO electrode 22 is formed in the inside surface of the 2nd substrate 20 as a common electrode. Although the common electrode 22 is formed here so that it may intersect perpendicularly with the segment electrode 32 currently formed in the inside surface of the 1st substrate 30 in order to form the wiring electrode 42 for external drawers on the 1st substrate 30 also about the common electrode 22 (the wiring electrode 43 for external drawers of the segment electrode 32 -- (--- parallel to this --- making ---) ---) In order to form in the portion which the 1st substrate 30 exposed, the circuit pattern of the common electrode 22 on the 2nd substrate 20 For example, bend at a right angle, the common electrode 22 lengthens this about, and it considers as the section (lengthening about it connects [Electrode;] with the common electrode 22 electrically lengthening about electrode) 24 so that it may become parallel to the circuit pattern of the segment electrode 32 on the 1st substrate 30 just before a sealant 26. It lengthens about. it connects with the common electrode 22 on the 2nd substrate 20 electrically -- this -- an electrode 24 Extend on the 1st substrate 30 through the vertical flow section (through hole) 29 currently drilled into the sealant 26 (see drawing 6), and it sets on the 1st substrate 30. It is made to expose with the circuit pattern (wiring electrode for external drawers) 43 of the segment

electrode 32, and is considering as the wiring electrode 42 for external drawers.

[0005] In addition, it is shown by the plan of drawing 5 as if the common electrode 22 and the segment electrode 32 crossed, but if the cross section is drawn, the common electrode 22 and the segment electrode 32 do not cross in fact so that clearly (that is, it is not in contact (short circuit)).

[0006] Thus, it is made to meet (opposite), heating sticking by pressure is carried out, and this is made into the substrate for liquid crystal display elements so that some ITO electrodes 22 and some ITO electrodes 32 may expose the 2nd substrate 20 and 1st substrate 30, respectively. Namely, the 2nd substrate 20 and 1st substrate 30 The gap which becomes settled with the thickness of the gap material (spacer) 35 mutually is separated, and it counters. Moreover, the 2nd substrate 20 and 1st substrate 30 By method to which some ITO electrodes 22 and some ITO electrodes 32 are exposed, except for the liquid crystal impregnation section 40, the seal (closure) of the mutual periphery of the 2nd substrate 20 and the 1st substrate 30 is carried out by the sealant 26, and it is produced by this as a substrate for liquid crystal display elements.

[0007] With such a substrate for liquid crystal display elements, a liquid crystal material is poured into the gap separated by the sealant 26 between the 2nd substrate 20 and the 1st substrate 30, and the gap material 35 from the liquid crystal impregnation section 40, and this can be produced as a liquid crystal display (liquid crystal display element) by closing the liquid crystal impregnation section 40 with encapsulant after an appropriate time.

[0008] In addition, the liquid crystal display (substrate for liquid crystal display elements) is the so-called thing of piece lateral electrode ejection form in which both wiring electrodes 42 and 43 for external drawers (electrode takeoff connection) were formed on the 1st substrate 30, in this case.

[0009] Thus, the amount of transmitted lights is controllable by the voltage impressed between the segment electrodes and common electrodes which counter with the produced liquid crystal display element. That is, the amount of [of the common stripe-like electrode 22 and the stripe-like segment electrode 32] (a part for the intersection of a circuit pattern) intersection can be made to function as one dot of a liquid crystal display screen. By impressing a predetermined driving signal to the wiring electrode 42 for external drawers and the wiring electrode 43 for external drawers which have been exposed more concretely It lengthens about to the common electrode 22, and a driving signal is added through an electrode 24. Again A direct-drive signal can join the segment electrode 32, the orientation condition of the liquid crystal for an intersection of the common electrode 22 and the segment electrode 32 can be changed, and a predetermined alphabetic character, a predetermined graphic form, etc. can be displayed on this screen.

[0010]

[Problem(s) to be Solved by the Invention] in the liquid crystal display (liquid crystal display element) of the above piece lateral electrode ejection form , since what is necessary be just to form the wiring electrodes 42 and 43 for external drawers in the 1st substrate 30 in one substrate and the example of drawing 5 , a mounting gestalt can be simplify (since voltage be impress to the electrode pattern by the side of the substrate 30 with which the wiring electrode for external drawers be prepare from the exterior through the vertical flow section 29) , and there be an advantage that a miniaturization can be attain .

[0011] by the way, in the liquid crystal display (liquid crystal display element) of the above piece lateral electrode ejection form In the 2nd substrate 20 the common electrode 22 It lengthens about from the wiring electrode 42 for external drawers, and wiring is carried out to a display through an electrode 24 (that is, so that it may intersect perpendicularly with the segment electrode 32 on the 1st substrate 30). It lengthens about, an electrode 24 is bent at a right angle in the place of a suitable location, and it considers as the common electrode 22. At this time With the common electrode 22 near an external end-connection child (the wiring electrode for external drawers; electrode takeoff connection), and the common electrode 22 far from an external end-connection child (the wiring electrode for external drawers; electrode takeoff connection) Since [to these common electrodes 22] it lengthened about and the length of an electrode 24 differed, respectively, it lengthened about and there was a problem that the difference in the wiring resistance by the difference in the length of an electrode 24 affected the driver voltage impressed to a display.

[0012] A display is especially constituted by the dot-matrix section and the icon section. The icon section serves as arrangement far from an external end-connection child, and are larger than the display electrode area whose display electrode area of the icon section is one line of the dot-matrix section further. When the flowing current became large, it lengthened about, wiring resistance of an electrode 24 increased, the voltage drop by this to the icon section became large, and there was a problem that sufficient voltage for the icon section could not be impressed. Thus, in the liquid crystal display (liquid crystal display element) of piece lateral electrode ejection form, there were problems, like the display concentration unevenness which lengthens about and originates in the difference of the amount of voltage drops by the difference in wiring resistance of an electrode 24 arises.

[0013] In addition, as a method of reducing the difference of the amount of voltage drops by wiring resistance, the method (the 1st method) using the small electrode of surface electrical resistance and the methods (it lengthens about, the width of face of an electrode 24 is changed, and wiring resistance is equalized) (the 2nd method) of devising an electrode pattern configuration can be considered. However, in the 1st method of the above, the small electrode of surface electrical resistance has the problem that cost is high compared with the big electrode of surface electrical resistance, on the process. Moreover, in the 2nd method of the above, when there was a limit that the field which lengthens about and arranges an electrode 24 is narrow etc., there was a problem that this was inapplicable.

[0014] This invention aims at offering the possible liquid crystal display of preventing effectively the display concentration unevenness which lengthens about and originates in the difference of the amount of voltage drops by the difference in wiring resistance of an electrode, even when surface electrical resistance uses a comparatively high electrode.

[0015]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, invention according to claim 1 The 1st substrate which equipped the inside surface with a segment electrode, and an object for segment electrodes and an external drawer electrode for common electrodes, The 2nd substrate which it lengthened about for [which is electrically connected to a common electrode and a common electrode on the inside surface] common electrodes, and was equipped with an electrode In a liquid crystal display which controls the amount of transmitted lights by voltage which pastes up through a sealant, sandwiches liquid crystal between the 1st substrate and the 2nd substrate, and is impressed between segment electrodes and common electrodes which counter It lengthens about. a conductive material contains in said sealant -- having -- **** -- moreover -- said -- some electrodes [at least] It extends along with a portion on the 2nd substrate which said sealant pastes up. To said 1st substrate Lengthen about and it makes said a part of said 2nd substrate up [at least] which is an electrode counter in the inside surface. An electrode for the increment in current pass is further formed in a portion which said sealant pastes up, and a common electrode prepared in the inside surface of the 2nd substrate lengthens about. Some electrodes [at least] It is characterized by being constituted so that electric conduction contact may be carried out through a sealant containing a conductive material with an electrode for the increment in current pass prepared in the inside surface of the 1st substrate.

[0016] Moreover, invention according to claim 2 is characterized by said thing [that lengthen about and some patterns of an electrode are prepared in a sealant] in a liquid crystal display according to claim 1.

[0017] Moreover, invention according to claim 3 is characterized by connecting with an external drawer electrode currently formed in the 1st substrate, and an electric target through a sealant which is formed in said 2nd substrate and in which it lengthens about and an electrode contains a conductive material in a liquid crystal display according to claim 1 or 2.

[0018]

[Embodiment of the Invention] Hereafter, the operation gestalt of this invention is explained based on a drawing. Drawing showing the example of a configuration of the liquid crystal display which drawing 1 requires for this invention, a cross section [in / in drawing 2 / the A-A line of drawing 1], and drawing 3 are the cross sections in the B-B line of drawing 1 . Reference of drawing 1 constitutes mostly the 1st substrate 30 with which this liquid crystal display equipped the inside surface with the segment electrode

(signal lateral electrode) 32, and the 2nd substrate 20 which equipped the inside surface with the common electrode (scan electrode; common side display electrode) 22 in the periphery section as a thing inside these substrates 20 and 30 pasted up by the sealant 26.

[0019] Here, in this invention, the conductive material contains in the sealant 26. As a conductive material, in addition, for example, a conductive particle as shown in JP,8-113654,A (For example, a room temperature and the compression disruptive strength of the particle measured on condition that load speed 0.158gf/a second are two or less [4 kgf(s)/mm].) And the conductive particle whose mean particle diameter which has a conductive layer is about 2-30 micrometers can be used for the surface of the karyomitome particle by which crushing is carried out in non-plastic by pressurizing for 1 - 10 seconds by the pressure of 10-30kg/cm² with the temperature of 120-170 degrees C. Into a sealant 26 (for example, insulating adhesives), 50-5000 pieces /can be distributed in the amount of 2 mm, and such a conductive particle can be used. In this case, when pasting up the 1st substrate 30 and 2nd substrate 20 by the sealant 26 by which the above conductive particles were distributed (sticking by pressure) By the conductive particle contained in the sealant 26 which intervenes between the 1st substrate 30 and the 2nd substrate 20 like the after-mentioned While a sealant has a flow property in the direction (lengthwise direction) to which the 1st substrate 30 and 2nd substrate 20 are connected, it functions on a longitudinal direction as a sealant of the so-called different direction conductivity which does not have a flow property (the insulating property of sealant 26 the very thing is held).

[0020] More concretely, the circuit pattern of the stripe-like ITO electrode 32 is formed in the inside surface of the 1st substrate 30 as a segment electrode, and in the example of a configuration of drawing 1 , these segment electrode 32 was prolonged straightly, and is exposed as a wiring electrode 43 for external drawers with a part of 1st substrate 30 in it. Moreover, the circuit pattern of the stripe-like ITO electrode 22 is formed in the inside surface of the 2nd substrate 20 as a common electrode. Although the common electrode 22 is formed here so that it may intersect perpendicularly with the segment electrode 32 currently formed in the inside surface of the 1st substrate 30 in order to form the wiring electrode 42 for external drawers on the 1st substrate 30 also about the common electrode 22 (the wiring electrode 43 for external drawers of the segment electrode 32 -- (--- parallel to this --- making ---) ---) In order to form in the portion which the 1st substrate 30 exposed, the circuit pattern of the common electrode 22 on the 2nd substrate 20 For example, bend at a right angle, the common electrode 22 lengthens this about, and it considers as the section (lengthening about it connects [Electrode;] with the common electrode 22 electrically lengthening about electrode) 24 so that it may become parallel to the circuit pattern of the segment electrode 32 on the 1st substrate 30 just before a sealant 26. It lengthens about. the common electrode 22 on the 2nd substrate 20 -- this -- about partial 24a of an electrode 24 Only when connecting this with the wiring electrode 42 for external drawers on the 1st substrate 30 Make a sealant 26 contact, extend through the sealant 26 which the conductive material contained on the 1st (minding sealant 26 (vertical flow section) which conductive material contained) substrate 30 (see drawing 2), and it sets on the 1st substrate 30. It is made to expose with the circuit pattern (wiring electrode 43 for external drawers) of the segment electrode 32, and is considering as the wiring electrode 42 for external drawers.

[0021] On the other hand, the common electrode 22 on the 2nd substrate 20 lengthens about. About other partial 24b of an electrode 24 It extends in the condition of having made the sealant 26 which extended this along with the portion on the 2nd substrate 20 which a sealant 26 pastes up, namely, the conductive material contained contacting. Extend through the sealant 26 which the conductive material contained on the 1st (minding sealant 26 (vertical flow section) which conductive material contained) substrate 30 (see drawing 3), and it sets on the 1st substrate 30. It is made to expose with the circuit pattern (wiring electrode 43 for external drawers) of the segment electrode 32, and is considering as the wiring electrode 42 for external drawers.

[0022] In addition, it is shown by the plan of drawing 1 as if the common electrode 22 and the segment electrode 32 crossed, but if the cross section is drawn, the common electrode 22 and the segment electrode 32 do not cross in fact so that clearly (that is, it is not in contact (short circuit)).

[0023] Moreover, in this invention, while making a sealant 26 contain a conductive material, the electrode

25 for the increment in current pass is further formed in the portion which a sealant 26 pastes up on the 1st substrate 30 in the inside surface. That is, as the common electrode 22 prepared in the inside surface of the 2nd substrate 20 lengthens about and partial 24b of an electrode 24 is shown in drawing 3, it consists of this inventions so that electric conduction contact may be carried out through this sealant 26 in which it lengthens about and electrode 24b contains a conductive material with the electrode 25 for the increment in current pass prepared in the inside surface of the 1st substrate.

[0024] The 1st substrate 30 which equipped the inside surface with the segment electrode 32, and the object for segment electrodes and the external drawer electrodes 43 and 42 for common electrodes in this invention when putting in another way, The 2nd substrate 20 which it lengthened about for [which is electrically connected to the common electrode 22 and the common electrode 22 on the inside surface] common electrodes, and was equipped with the electrode 24 In the liquid crystal display which controls the amount of transmitted lights by voltage which pastes up through a sealant 26, sandwiches liquid crystal between the 1st substrate 30 and the 2nd substrate 20, and is impressed between the segment electrodes 32 and the common electrodes 22 which counter It lengthens about. a conductive material contains in said sealant 26 -- having -- **** -- moreover -- said -- some electrodes [at least] 24 It extends along with the portion on the 2nd substrate 20 which said sealant 26 pastes up. To said 1st substrate 30 Lengthen about and it makes said a part of said 2nd substrate 20 up [at least] one which is an electrode 24 counter in the inside surface. The electrode 25 for the increment in current pass is further formed in the portion which said sealant 26 pastes up. The common electrode 22 prepared in the inside surface of the 2nd substrate 20 lengthens about, and some electrodes [at least] 24 are constituted so that electric conduction contact may be carried out through the sealant 26 containing a conductive material with the electrode 25 for the increment in current pass prepared in the inside surface of the 1st substrate 30.

[0025] in addition, the segment electrode 32 formed on the 1st substrate 30 here, the wiring electrodes 43 and 42 for external drawers, the electrode 25 for the increment in current pass, and the common electrode 22 boiled and formed on the 2nd substrate 20 -- it lengthens about and the electrode 24 is constituted as an ITO electrode (transparent electrode).

[0026] The common electrode 22 prepared in the inside surface of the 2nd substrate 20 lengthens about. Thus, about partial 24b of an electrode 24 Since it is constituted so that electric conduction contact may be carried out through this sealant 26 in which it lengthens about and electrode 24b contains a conductive material with the electrode 25 for the increment in current pass prepared in the inside surface of the 1st substrate as shown in drawing 3 Even if it lengthens about, and electrode 24b has long length, and lengthens about and the wiring resistance of the electrode 24b itself is large This is electrically contacted to the sealant 26 and the electrode 25 for the increment in current pass containing a conductive material, and it becomes possible by making these into one electrode to reduce wiring resistance.

[0027] With such a configuration, the segment electrode 32, the wiring electrodes 43 and 42 for external drawers, and the electrode 25 for the increment in current pass are formed on the 1st substrate 30. Moreover, on the 2nd substrate 20, the common electrode 22 and after lengthening about and forming an electrode 24, it is made to meet (opposite) and heating sticking by pressure is carried out so that the wiring electrodes 42 and 43 for external drawers may expose the 2nd substrate 20 and 1st substrate 30, respectively. Namely, the 2nd substrate 20 and 1st substrate 30 The gap which becomes settled with the thickness of the gap material (spacer) 35 mutually is separated, and it counters. Moreover, the 2nd substrate 20 and 1st substrate 30 Each of the 2nd substrate 20 and the 1st substrate 30 mostly by method to which the wiring electrodes 42 and 43 for external drawers are exposed a periphery A seal (closure) is carried out except for the liquid crystal impregnation section 40 by the sealant 26 containing a conductive material, and it is produced by this as a substrate for liquid crystal display elements.

[0028] And a liquid crystal material is poured into the gap separated by the sealant 26 between the 2nd substrate 20 and the 1st substrate 30, and the gap material 35 from the liquid crystal impregnation section 40, and this can be produced as a liquid crystal display element by closing the liquid crystal impregnation section 40 with encapsulant after an appropriate time.

[0029] Thus, the amount of transmitted lights is controllable by the voltage impressed between the

segment electrodes and common electrodes which counter with the produced liquid crystal display element. That is, the amount of [of the common stripe-like electrode 22 and the stripe-like segment electrode 32] (a part for the intersection of a circuit pattern) intersection can be made to function as one dot of a liquid crystal display screen. By impressing a predetermined driving signal to the wiring electrode 42 for external drawers and the wiring electrode 43 for external drawers which have been exposed more concretely It lengthens about to the common electrode 22, and a driving signal is added through an electrode 24. Again A direct-drive signal can join the segment electrode 32, the orientation condition of the liquid crystal for an intersection of the common electrode 22 and the segment electrode 32 can be changed, and a predetermined alphabetic character, a predetermined graphic form, etc. can be displayed on this screen. [0030] by the way, in the liquid crystal display (liquid crystal display element) of the above piece lateral electrode ejection form As mentioned above, it sets to the 2nd substrate 20. With the common electrode 22 near an external end-connection child (the wiring electrode for external drawers; electrode takeoff connection), and the common electrode 22 far from an external end-connection child (the wiring electrode for external drawers; electrode takeoff connection) Since [to these common electrodes 22] it lengthened about and the length of an electrode 24 differed, respectively, it lengthened about and there was a problem that the difference in the wiring resistance by the difference in the length of an electrode 24 affected the driver voltage impressed to a display.

[0031] In this invention, the common electrode 22 on the 2nd substrate 20 lengthens about. On the other hand, about partial (it is thought that length is long lengthening about electrode) 24b of an electrode 24 extending this along with the installation portion of a sealant 26 in the condition of having made it contacting electrically, to the electrode 25 for the increment in current pass on the sealant 26 containing a conductive material, and the 1st substrate 30 -- (drawing 3 -- reference) -- this -- it lengthens about and the wiring resistance of electrode 24b can be reduced substantially. for example, length is long -- it lengthens about and the substantial wiring resistance of electrode 24b can be made comparable as the wiring resistance of short paddle ***** electrode of length 24a. It lengthens about, and an electrode is formed and it lengthens about. thus, length differs -- from the electrode itself By lengthening about and contacting an electrode to the electrode for the increment in current pass through a sealant (sealant which the conductive material contained), even when wiring resistance changes with differences of length It can control to the thing of a request of the wiring resistance, and the display concentration unevenness which lengthens about and originates in the difference of the amount of voltage drops by the difference in wiring resistance of an electrode can be prevented effectively. That is, it lengthens about and the problem that the difference in the wiring resistance by the difference in the length of an electrode affects the driver voltage impressed to a display can be avoided.

[0032] A display is constituted by the dot-matrix section and the icon section as especially shown in drawing 4 . The icon section serves as arrangement far from an external end-connection child, and are larger than the display electrode area whose display electrode area of the icon section is one line of the dot-matrix section further. Although there was a problem to the dot-matrix section that it lengthens about, and it lengthens about, wiring resistance of electrode 24b increased, the voltage drop by this to the icon section became large rather than wiring resistance of electrode 24a, and sufficient voltage for the icon section could not be impressed when the flowing current became large It lengthens about. the icon section -- about electrode 24b By constituting so that electric conduction contact of this may be carried out through the sealant 26 containing a conductive material with the electrode 25 for the increment in current pass prepared in the inside surface of the 1st substrate, as shown in drawing 3 It can lengthen about, the increment in wiring resistance of an electrode 24 can be suppressed, a voltage drop can be suppressed, and it becomes possible to impress sufficient voltage also for the icon section.

[0033]

[Example]

As an example of example this invention, two transparent plastic film substrates (150 micrometers in thickness) 20 and 30 with which the transparent electrode film (surface-electrical-resistance 300ohm/**) was formed in one side were prepared, and one [20] of two sheets carried out patterning of other 1 sheet

30 using well-known photolithography technology so that it might become the common lateral electrode pattern of a liquid crystal display element, and it might become the segment lateral electrode pattern of a liquid crystal display element. And when the common side substrate 20 and the segment side substrate 30 are combined, the display of this liquid crystal display element (when it piles up) The longitudinal direction of two or more band-like (the shape of a stripe) common electrodes 22 and the longitudinal direction of two or more band-like (the shape of a stripe) segment electrodes 32 intersect perpendicularly, respectively, and it is made to counter. It constituted from the dot-matrix section used as the picture element of two or more rectangles, and the icon section from which the lap section of a segment electrode and a common electrode serves as a configuration of an alphabetic character or a mark.

[0034] Under the present circumstances, it lengthened about and the electrode has been arranged with the segment lateral electrode in the location to the common lateral electrode pattern to the dot-matrix section which does not counter. Moreover, it lengthened about and some electrodes have been arranged in the location (portion in alignment with a sealant) to the common lateral electrode pattern to the icon section which serves as a periphery seal after cel-izing. Moreover, by lengthening about, others lengthened about in the surface of a some electrodes and the segment side substrate which counters 30 to the common lateral electrode pattern to the icon section, i.e., the 1st substrate, and the electrode and the display electrode formed the independent electrode pattern 25 for the increment in current pass in it. In addition, as shown in drawing 3 , after cel-izing, this electrode pattern 25 for the increment in current pass is lengthened about a common side, and is electrically connected with an electrode 24 through a conductive (it distributes in the sealant) particle (it prepares in order to lower effectual wiring resistance by increasing the pass of current).

[0035] Thus, after forming a circuit pattern in each substrates 20 and 30, orientation agent application, baking, and a rubbing production process were given to each substrates 20 and 30. subsequently, to the 2nd substrate (namely, substrate with which two or more common lateral electrode patterns were formed) 20 in which the external end-connection child (wiring electrodes 42 and 43 for external drawers) is not prepared It is the 1st substrate (that is, when it piles up with two or more segment electrode patterns and the external end-connection child (substrate with which the wiring electrodes 42 and 43 for external drawers were formed) 30) about this substrate 20. In the 1st substrate 30, the rectangular precut hole was pierced and formed in the corresponding location by **** so that an external end-connection child (wiring electrodes 42 and 43 for external drawers) might expose. And the gap material 35 for obtaining a desired cel gap on the 2nd substrate 20 was sprinkled.

[0036] Subsequently, the sealant 26 which serves as a periphery seal of a liquid crystal display element after cel-izing was printed with screen printing on the 1st substrate 30. Here, in the sealant 26, the conductive particle made of resin which gold-plated on the surface was distributed. In addition, as the 1st reason, it lengthens about, and it is for connecting electrically the wiring electrode 42 for the external drawers formed on an electrode 24 and the 1st substrate 30 formed on the 2nd substrate 20 through the conductive particle in a sealant 26 to distribute a conductive particle in a sealant 26 (in order to form the vertical flow section). By having made this [26], i.e., a sealant, distribute a conductive particle, as shown in drawing 6 , it is not necessary to form the vertical flow section (through hole) 29 into a sealant 26.

[0037] Moreover, it is for lengthening about, connecting electrically the electrode 24 and the electrode pattern 25 for the increment in current pass formed on the 1st substrate 30 formed on the 2nd substrate 20 through the conductive particle in the seal section 26, and making current pass increase as the 1st reason to distribute a conductive particle in a sealant 26.

[0038] The gap material 35 is sprinkled on the 2nd substrate 20. Thus, again After printing the sealant 26 which contains a conductive particle on the 1st substrate 30, Superposition and the piled-up substrates 20 and 30 of a pair were pinched for the 2nd substrate 20 and 1st substrate 30 between the glass plate with the smooth surface, and the balloon made of silicone rubber, where the substrate which enclosed and laid Ayr on top of the balloon is pressurized, it heated, and the sealant 26 was hardened.

[0039] Subsequently, after cutting the piled-up substrates 20 and 30 of a pair, liquid crystal was enclosed, and two or more liquid crystal display elements were obtained. In this way, the display condition when

lengthening about, and there being no display concentration unevenness generating to wiring resistance and the dot-matrix section of an electrode lengthening about and according to the difference from wiring resistance of an electrode, and impressing driver voltage to the icon section of the produced liquid crystal display element was good.

[0040] In the example of the example comparison of a comparison, although the liquid crystal display element was produced by the same method as an above-mentioned example using the substrate with which the electrode of 300ohms of surface electrical resistance and ** was formed, in the example of a comparison, the electrode pattern 25 for the increment in current pass in an above-mentioned example was not formed. Thus, it lengthened about, and wiring resistance of an electrode was strong and the liquid crystal display element of the produced example of a comparison was seen making a mistake in clearly [when / to the icon section / driver voltage is impressed / the display concentration of the dot-matrix section and the icon section] (unevenness).

[0041]

[Effect of the Invention] As explained above, according to invention according to claim 1 to 3 The 1st substrate which equipped the inside surface with the segment electrode, and the object for segment electrodes and the external drawer electrode for common electrodes, The 2nd substrate which it lengthened about for [which is electrically connected to a common electrode and a common electrode on the inside surface] common electrodes, and was equipped with the electrode In the liquid crystal display which controls the amount of transmitted lights by voltage which pastes up through a sealant, sandwiches liquid crystal between the 1st substrate and the 2nd substrate, and is impressed between the segment electrodes and common electrodes which counter The conductive material contains in the sealant and it lengthens about. Some electrodes [at least] It extends along with the portion on the 2nd substrate which a sealant pastes up. To the 1st substrate Lengthen about on the 2nd substrate and some electrodes [at least] are made to counter in the inside surface. The electrode for the increment in current pass is further formed in the portion which a sealant pastes up, and the common electrode prepared in the inside surface of the 2nd substrate lengthens about. Some electrodes [at least] Since it is constituted so that electric conduction contact may be carried out through the sealant containing a conductive material with the electrode for the increment in current pass prepared in the inside surface of the 1st substrate Through a sealant, electric conduction contact is carried out with the electrode for the increment in current pass, and it lengthens about. About an electrode Effect wiring resistance as a matter of fact can be reduced, and even when it lengthens about and the electrode of comparatively big surface electrical resistance is used for the electrode itself, generating of the display concentration unevenness by the difference in wiring resistance can be prevented effectively. By preparing the electrode for the increment in current pass especially, even if it lengthens about and makes pattern width of face of an electrode small, it lengthens about, and wiring resistance comparable as the case where the pattern width of face of an electrode is large is obtained, therefore it can lengthen about, pattern width of face of an electrode can be made as small as possible, and a compact (it is small) liquid crystal display (liquid crystal display element) can be offered.

[0042] Moreover, since according to invention according to claim 2 it lengthens about and some electrode patterns are prepared in seal circles, the so-called periphery portion (rim-of-duct-mouths portion) from a display to the appearance of a liquid crystal display element can be narrowed.

[0043] It lengthens about. moreover, according to invention according to claim 3, it is formed in the 2nd substrate in the liquid crystal display according to claim 1 or 2 -- an electrode Since it connects with the external drawer electrode and the electric target which are formed in the 1st substrate through the sealant containing a conductive material It becomes unnecessary to prepare a vertical flow hole like before into a sealant the common electrode on the 2nd substrate, and lengthening about and connecting an electrode to the external drawer electrode and the electric target on the 1st substrate.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is drawing showing the example of a configuration of the liquid crystal display concerning this invention.

[Drawing 2] It is a cross section in the A-A line of drawing 1 .

[Drawing 3] It is a cross section in the B-B line of drawing 1 .

[Drawing 4] It is the outline plan showing an example of a liquid crystal display element (liquid crystal display).

[Drawing 5] It is the outline plan showing an example of a liquid crystal display element (liquid crystal display).

[Drawing 6] It is a cross section in the B-B line of drawing 5 .

[Description of Notations]

20 2nd Substrate

22 Common Electrode

24 Lengthen about and it is Electrode.

25 Electrode for Increment in Current Pass

26 Sealant

29 Vertical Flow Section

30 1st Substrate

32 Segment Electrode

35 Gap Material

42 Wiring Electrode for External Drawers .

43 Wiring Electrode for External Drawers

[Translation done.]

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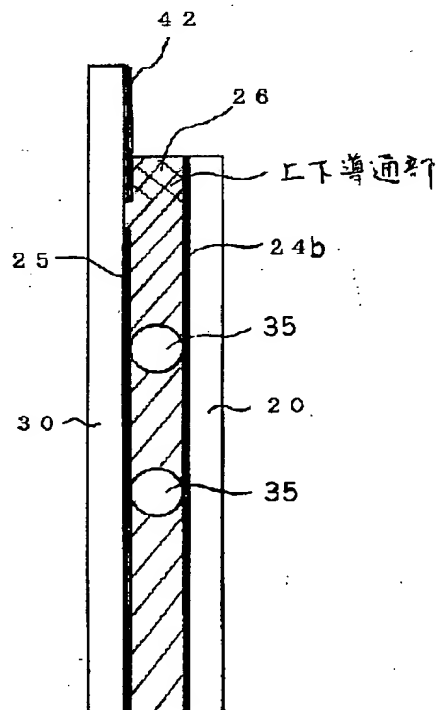
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(54) 【発明の名称】 液晶表示装置

(57) 【要約】

【課題】 表面抵抗が比較的高い電極を用いた場合でも、引き廻し電極の配線抵抗の違いによる電圧降下量の差に起因する表示濃度むらを有効に防止する。

【解決手段】 第2の基板20の内側表面に設けられたコモン電極22の引き廻し電極24の一部24bについては、この引き廻し電極24bが導電性材料を含有するシール材26を介して、第1の基板の内側表面に設けられた電流バス増加用電極25と導電接触するよう構成されている。



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【特許請求の範囲】

【請求項1】 内側表面にセグメント電極とセグメント電極用、コモン電極用の外部引き出し電極とを備えた第1の基板と、内側表面にコモン電極とコモン電極に電気的に接続されるコモン電極用の引き廻し電極とを備えた第2の基板とを、シール材を介して接着し、第1の基板と第2の基板との間に液晶を挟み、対向するセグメント電極とコモン電極との間に印加される電圧によって透過光量を制御する液晶表示装置において、前記シール材には導電性材料が含有されており、また、前記引き廻し電極の少なくとも一部は、前記シール材が接着される第2の基板上の部分に沿って延び、また、前記第1の基板には、その内側表面において、前記第2の基板上の前記引き廻し電極の少なくとも一部に対向させて、前記シール材が接着される部分に電流パス増加用電極がさらに形成されており、第2の基板の内側表面に設けられたコモン電極の引き廻し電極の少なくとも一部は、導電性材料を含有するシール材を介して、第1の基板の内側表面に設けられた電流パス増加用電極と導電接触するよう構成されていることを特徴とする液晶表示装置。

【請求項2】 請求項1記載の液晶表示装置において、前記引き廻し電極のパターンの一部は、シール材内に設けられていることを特徴とする液晶表示装置。

【請求項3】 請求項1または請求項2記載の液晶表示装置において、前記第2の基板に形成されている引き廻し電極は、導電性材料を含有するシール材を介して、第1の基板に形成されている外部引き出し電極と電気的に接続されることを特徴とする液晶表示装置。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明は、内側表面にセグメント電極(信号側電極)とセグメント電極用、コモン電極用の外部引き出し電極とを備えた第1の基板と、内側表面にコモン電極(走査電極)とコモン電極に電気的に接続されるコモン電極用の引き廻し電極とを備えた第2の基板とを、例えば、これら基板の周縁部において、シール材を介して接着し、第1の基板と第2の基板との間に液晶を挟み、対向するセグメント電極とコモン電極との間に印加される電圧によって透過光量を制御する液晶表示装置(液晶表示素子)に関する。

【0002】

【従来の技術】近年、PDA(携帯情報端末)、携帯電話等の携帯機器におけるマンマシンインタフェースとなるディスプレイとして、液晶表示素子(液晶表示装置)が注目を集めている。図5はこの種の液晶表示素子(液晶表示装置)の一例を示す概略平面図、図6は図5のB-B線における断面図である。

【0003】図5、図6を参照すると、この液晶表示装置は、内側表面にセグメント電極(信号側電極)32を備えた第1の基板30と、内側表面にコモン電極(走査電

極;コモン側表示電極)22を備えた第2の基板20とが、これら基板20、30の内側の周縁部において、シール材26によって接着されたものとして構成されている。

【0004】すなわち、第1の基板30の内側表面には、ストライプ状のITO電極32の配線パターンがセグメント電極として形成されており、これらセグメント電極32は、真直ぐに延びて、第1の基板30の一部で外部引き出し用配線電極43として露出している。また、第2の基板20の内側表面には、ストライプ状のITO電極22の配線パターンがコモン電極として形成されている。ここで、コモン電極22は、第1の基板30の内側表面に形成されているセグメント電極32と直交するように形成されるが、コモン電極22についても、その外部引き出し用配線電極42を第1の基板30上に形成するため(セグメント電極32の外部引き出し用配線電極43とともに(これと平行させて)、第1の基板30の露出した部分に形成するため)、第2の基板20上のコモン電極22の配線パターンを、例えばシール材26の直前で第1の基板30上のセグメント電極32の配線パターンと平行となるように直角に曲げてこれをコモン電極22の引き廻し部(引き廻し電極;コモン電極22に電気的に接続される引き廻し電極)24とし、第2の基板20上のコモン電極22と電気的に接続されるこの引き廻し電極24を、シール材26中に穿設されている上下導通部(スルーホール)29を介して第1の基板30上に延ばし(図6を参照)、第1の基板30上において、セグメント電極32の配線パターン(外部引き出し用配線電極)43とともに露出させて、外部引き出し用配線電極42としている。

【0005】なお、図5の平面図では、コモン電極22とセグメント電極32とがあたかも交差しているかのように示されているが、その断面図を描けば明らかに、コモン電極22とセグメント電極32とは実際には交差していない(すなわち、接触(短絡)していない)。

【0006】このように、第2の基板20と第1の基板30とを、ITO電極22の一部、ITO電極32の一部がそれぞれ露出するように、対面(対向)させて、加熱圧着し、これを液晶表示素子用基板としている。すなわち、第2の基板20と第1の基板30とは、互いにギャップ材(スペーサ)35の厚さによって定まる間隔を隔てて対向し、また、第2の基板20と第1の基板30とは、ITO電極22の一部、ITO電極32の一部を露出させるような仕方で、第2の基板20と第1の基板30の互いの周縁が、液晶注入部40を除いて、シール材26によってシール(封止)され、これによって、液晶表示素子用基板として作製されている。

【0007】このような液晶表示素子用基板では、第2の基板20と第1の基板30との間のシール材26、ギャップ材35によって隔てられた間隙に、液晶注入部4

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0から液晶材料を注入し、しかる後、液晶注入部40を封止剤で封止することで、これを液晶表示装置(液晶表示素子)として作製できる。

【0008】なお、この場合、液晶表示装置(液晶表示素子用基板)は、第1の基板30上に、外部引き出し用配線電極(電極取り出し部)42、43の両方が形成された所謂、片側電極取り出し型式のものとなっている。

【0009】このように作製された液晶表示素子では、対向するセグメント電極とコモン電極との間に印加される電圧によって透過光量を制御することができる。すなわち、ストライプ状のコモン電極22とストライプ状のセグメント電極32との交差部分(配線パターンの交差部分)を液晶表示画面の1つのドットとして機能させることができる。より具体的に、露出している外部引き出し用配線電極42、外部引き出し用配線電極43に所定の駆動信号を印加することで、コモン電極22には引き廻し電極24を介して駆動信号が加わり、また、セグメント電極32には直接駆動信号が加わり、コモン電極22、セグメント電極32の交差部分の液晶の配向状態を変化させ、この画面上に所定の文字や図形などを表示させたりすることができる。

【0010】

【発明が解決しようとする課題】上記のような片側電極取り出し型式の液晶表示装置(液晶表示素子)では、外部引き出し用配線電極42、43を一方の基板、図5の例では第1の基板30に設けるだけで良いので(外部引き出し用配線電極が設けられていない基板30側の電極パターンには、上下導通部29を介して外部から電圧が印加されるので)、実装形態を単純化でき、小型化が図れるという利点がある。

【0011】ところで、上記のような片側電極取り出し型式の液晶表示装置(液晶表示素子)では、第2の基板20において、コモン電極22は、外部引き出し用配線電極42から引き廻し電極24を介して表示部に布線され(すなわち、第1の基板30上のセグメント電極32と直交するように、引き廻し電極24を適当な位置のところで直角に曲げてコモン電極22とし)、このとき、外部接続端子(外部引き出し用配線電極;電極取り出し部)に近いコモン電極22と外部接続端子(外部引き出し用配線電極;電極取り出し部)から遠いコモン電極22とは、これらのコモン電極22への引き廻し電極24の長さがそれぞれ異なるため、引き廻し電極24の長さの違いによる配線抵抗値の違いが、表示部へ印加される駆動電圧に影響を与えるという問題があった。

【0012】特に、表示部がドットマトリクス部とアイコン部とにより構成され、アイコン部が外部接続端子から遠い配置となり、さらにアイコン部の表示電極面積がドットマトリクス部の1ライン分の表示電極面積よりも大きく、流れる電流が大きくなる場合には、アイコン部への引き廻し電極24の配線抵抗が増加し、これによる

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電圧降下が大きくなってしまい、アイコン部に十分な電圧を印加できないという問題があった。このように、片側電極取り出し型式の液晶表示装置(液晶表示素子)では、引き廻し電極24の配線抵抗の違いによる電圧降下量の差に起因する表示濃度むらが生じるなどの問題があった。

【0013】なお、配線抵抗による電圧降下量の差を低減する方法としては、表面抵抗の小さい電極を用いる方法(第1の方法)や、電極パターン形状を工夫する(引き廻し電極24の幅を変えて配線抵抗を均一化するなど)の方法(第2の方法)が考えられる。しかしながら、上記第1の方法においては、表面抵抗の小さな電極は、その製法上、表面抵抗の大きな電極にくらべてコストが高いという問題がある。また、上記第2の方法においては、引き廻し電極24を配置する領域が狭いなどの制限がある場合には、これを適用できないという問題があった。

【0014】本発明は、表面抵抗が比較的高い電極を用いた場合でも、引き廻し電極の配線抵抗の違いによる電圧降下量の差に起因する表示濃度むらを有効に防止することの可能な液晶表示装置を提供することを目的としている。

【0015】

【課題を解決するための手段】上記目的を達成するために、請求項1記載の発明は、内側表面にセグメント電極とセグメント電極用、コモン電極用の外部引き出し電極とを備えた第1の基板と、内側表面にコモン電極とコモン電極に電気的に接続されるコモン電極用の引き廻し電極とを備えた第2の基板とを、シール材を介して接着し、第1の基板と第2の基板との間に液晶を挟み、対向するセグメント電極とコモン電極との間に印加される電圧によって透過光量を制御する液晶表示装置において、前記シール材には導電性材料が含有されており、また、前記引き廻し電極の少なくとも一部は、前記シール材が接着される第2の基板上の部分に沿って延び、また、前記第1の基板には、その内側表面において、前記第2の基板上の前記引き廻し電極の少なくとも一部に対向させて、前記シール材が接着される部分に電流バス増加用電極がさらに形成されており、第2の基板の内側表面に設けられたコモン電極の引き廻し電極の少なくとも一部は、導電性材料を含有するシール材を介して、第1の基板の内側表面に設けられた電流バス増加用電極と導電接触するよう構成されていることを特徴としている。

【0016】また、請求項2記載の発明は、請求項1記載の液晶表示装置において、前記引き廻し電極のパターンの一部が、シール材内に設けられていることを特徴としている。

【0017】また、請求項3記載の発明は、請求項1または請求項2記載の液晶表示装置において、前記第2の基板に形成されている引き廻し電極が、導電性材料を含有するシール材を介して、第1の基板に形成されている

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外部引き出し電極と電氣的に接続されることを特徴としている。

【0018】

【発明の実施の形態】以下、本発明の実施形態を図面に基づいて説明する。図1は本発明に係る液晶表示装置の構成例を示す図、図2は図1のA-A線における断面図、図3は図1のB-B線における断面図である。図1を参照すると、この液晶表示装置は、内側表面にセグメント電極(信号側電極)32を備えた第1の基板30と、内側表面にコモン電極(走査電極;コモン側表示電極)22を備えた第2の基板20とが、これら基板20、30の内側のほぼ周縁部において、シール材26によって接着されたものとして構成されている。

【0019】ここで、本発明では、シール材26には導電性材料が含有されている。なお、導電性材料としては例えば特開平8-113654号に示されているような導電性粒子(例えば、室温、負荷速度0.158gf/秒の条件で測定した粒子の圧縮破壊強度が4kgf/cm²以下であり、かつ120~170℃の温度で10~30kg/cm²の圧力で1~10秒間加圧することにより非塑性的に圧潰される核材粒子の表面に導電性層を有する平均粒子径が2~30μm程度の導電性粒子)を用いることができ、このような導電性粒子をシール材26(例えば絶縁性接着剤)中に、50~5000個/mm²の量で分散させて用いることができる。この場合、第1の基板30と第2の基板20とを、上記のような導電性粒子が分散されたシール材26によって接着(圧着)するときに、後述のように、第1の基板30と第2の基板20との間に介在するシール材26に含まれる導電性粒子によって、シール材は第1の基板30と第2の基板20とを結ぶ方向(縦方向)に導通特性を有する一方、横方向には導通特性を有さない(シール材26自体の絶縁性特性が保持される)、所謂、異方導電性のシール材として機能する。

【0020】より具体的に、図1の構成例では、第1の基板30の内側表面には、ストライプ状のITO電極32の配線パターンがセグメント電極として形成されており、これらセグメント電極32は、真直ぐに延びて、第1の基板30の一部で外部引き出し用配線電極43として露出している。また、第2の基板20の内側表面には、ストライプ状のITO電極22の配線パターンがコモン電極として形成されている。ここで、コモン電極22は、第1の基板30の内側表面に形成されているセグメント電極32と直交するように形成されるが、コモン電極22についても、その外部引き出し用配線電極42を第1の基板30上に形成するため(セグメント電極32の外部引き出し用配線電極43とともに(これと平行させて)、第1の基板30の露出した部分に形成するため)、第2の基板20上のコモン電極22の配線パターンを、例えばシール材26の直前で第1の基板30上の

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セグメント電極32の配線パターンと平行となるように直角に曲げてこれをコモン電極22の引き廻し部(引き廻し電極;コモン電極22に電氣的に接続される引き廻し電極)24とし、第2の基板20上のコモン電極22のこの引き廻し電極24の一部24aについては、これを第1の基板30上の外部引き出し用配線電極42と接続するときのみ、シール材26に接触させ、導電性材料の含有されたシール材26を介して(導電性材料の含有されたシール材26(の上下導通部)を介して)第1の基板30上に延ばし(図2を参照)、第1の基板30上において、セグメント電極32の配線パターン(外部引き出し用配線電極43)とともに露出させて、外部引き出し用配線電極42としている。

【0021】一方、第2の基板20上のコモン電極22の引き廻し電極24の他の一部24bについては、これをシール材26が接着される第2の基板20上の部分に沿って延ばし、すなわち、導電性材料の含有されたシール材26に接触させた状態で延ばし、そして、導電性材料の含有されたシール材26を介して(導電性材料の含有されたシール材26(の上下導通部)を介して)第1の基板30上に延ばし(図3を参照)、第1の基板30上において、セグメント電極32の配線パターン(外部引き出し用配線電極43)とともに露出させて、外部引き出し用配線電極42としている。

【0022】なお、図1の平面図では、コモン電極22とセグメント電極32とがあたかも交差しているかのように示されているが、その断面図を描けば明らかに、コモン電極22とセグメント電極32とは実際には交差していない(すなわち、接触(短絡)していない)。

【0023】また、本発明では、シール材26には導電性材料を含有させるとともに、第1の基板30には、その内側表面において、シール材26が接着される部分に電流バス増加用電極25がさらに形成されている。すなわち、本発明では、第2の基板20の内側表面に設けられたコモン電極22の引き廻し電極24の一部24bについては、図3に示すように、この引き廻し電極24bが導電性材料を含有するシール材26を介して、第1の基板の内側表面に設けられた電流バス増加用電極25と導電接触するよう構成されている。

【0024】換言すれば、本発明では、内側表面にセグメント電極32とセグメント電極用、コモン電極用の外部引き出し電極43、42とを備えた第1の基板30と、内側表面にコモン電極22とコモン電極22に電氣的に接続されるコモン電極用の引き廻し電極24とを備えた第2の基板20とを、シール材26を介して接着し、第1の基板30と第2の基板20との間に液晶を挟み、対向するセグメント電極32とコモン電極22との間に印加される電圧によって透過光量を制御する液晶表示装置において、前記シール材26には導電性材料が含有されており、また、前記引き廻し電極24の少なくとも

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も一部は、前記シール材26が接着される第2の基板20上の部分に沿って延び、また、前記第1の基板30には、その内側表面において、前記第2の基板20上の前記引き廻し電極24の少なくとも一部に対向させて、前記シール材26が接着される部分に電流バス増加用電極25がさらに形成されており、第2の基板20の内側表面に設けられたコモン電極22の引き廻し電極24の少なくとも一部は、導電性材料を含有するシール材26を介して、第1の基板30の内側表面に設けられた電流バス増加用電極25と導電接触するよう構成されている。

【0025】なお、ここで、第1の基板30上に形成されるセグメント電極32、外部引き出し用配線電極43、42、電流バス増加用電極25、また、第2の基板20上に形成されるコモン電極22、引き廻し電極24は、ITO電極(透明電極)として構成されている。

【0026】このように、第2の基板20の内側表面に設けられたコモン電極22の引き廻し電極24の一部24bについては、図3に示すように、この引き廻し電極24bが導電性材料を含有するシール材26を介して、第1の基板の内側表面に設けられた電流バス増加用電極25と導電接触するよう構成されているので、引き廻し電極24bが例えば長さが長いものであって、引き廻し電極24b自体の配線抵抗値が大きいのであっても、これを導電性材料を含有するシール材26と電流バス増加用電極25に電氣的に接触させ、これらを1つの電極とすることで、配線抵抗値を低下させることが可能となる。

【0027】このような構成では、第1の基板30上に、セグメント電極32、外部引き出し用配線電極43、42、電流バス増加用電極25を形成し、また、第2の基板20上に、コモン電極22、引き廻し電極24を形成した後、第2の基板20と第1の基板30とを、外部引き出し用配線電極42、43がそれぞれ露出するように、対面(対向)させて、加熱圧着する。すなわち、第2の基板20と第1の基板30とは、互いにギャップ材(スペーサ)35の厚さによって定まる間隔を隔てて対向し、また、第2の基板20と第1の基板30とは、外部引き出し用配線電極42、43を露出させるような仕方、第2の基板20と第1の基板30の互いのほぼ周縁が、液晶注入部40を除いて、導電性材料を含有するシール材26によってシール(封止)され、これによって、液晶表示素子用基板として作製される。

【0028】そして、第2の基板20と第1の基板30との間のシール材26、ギャップ材35によって隔てられた間隙に、液晶注入部40から液晶材料を注入し、しかる後、液晶注入部40を封止剤で封止することで、これを液晶表示素子として作製できる。

【0029】このように作製された液晶表示素子では、対向するセグメント電極とコモン電極との間に印加される電圧によって透過光量を制御することができる。すな

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わち、ストライプ状のコモン電極22とストライプ状のセグメント電極32との交差部分(配線パターンとの交差部分)を液晶表示画面の1つのドットとして機能させることができる。より具体的に、露出している外部引き出し用配線電極42、外部引き出し用配線電極43に所定の駆動信号を印加することで、コモン電極22には引き廻し電極24を介して駆動信号が加わり、また、セグメント電極32には直接駆動信号が加わり、コモン電極22、セグメント電極32の交差部分の液晶の配向状態を変化させ、この画面上に所定の文字や図形などを表示させたりすることができる。

【0030】ところで、上記のような片側電極取り出し型式の液晶表示装置(液晶表示素子)では、前述したように、第2の基板20において、外部接続端子(外部引き出し用配線電極;電極取り出し部)に近いコモン電極22と外部接続端子(外部引き出し用配線電極;電極取り出し部)から遠いコモン電極22とでは、これらのコモン電極22への引き廻し電極24の長さがそれぞれ異なるため、引き廻し電極24の長さの違いによる配線抵抗値の違いが、表示部へ印加される駆動電圧に影響を与えるという問題があった。

【0031】これに対し、本発明では、第2の基板20上のコモン電極22の引き廻し電極24の一部(長さが長いと思われる引き廻し電極)24bについては、これを、導電性材料を含有するシール材26と第1の基板30上の電流バス増加用電極25に電氣的に接触させた状態で、シール材26の設置部分に沿って延ばすことで(図3を参照)、この引き廻し電極24bの配線抵抗値を実質的に低下させることができる。例えば、長さの長い引き廻し電極24bの実質的な配線抵抗値を長さの短い引き廻し電極24aの配線抵抗値と同程度のものにすることができる。このように、長さの異なる引き廻し電極が形成され、引き廻し電極自体だけからでは、長さの相違によって配線抵抗値が異なる場合でも、引き廻し電極をシール材(導電性材料の含有されたシール材)を介して電流バス増加用電極に接触させることで、その配線抵抗値を所望のものに制御することができ、引き廻し電極の配線抵抗の違いによる電圧降下量の差に起因する表示濃度むらを有効に防止することができる。すなわち、引き廻し電極の長さの違いによる配線抵抗値の違いが、表示部へ印加される駆動電圧に影響を与えるという問題を回避することができる。

【0032】特に、図4に示すように、表示部がドットマトリクス部とアイコン部とにより構成され、アイコン部が外部接続端子から遠い配置となり、さらにアイコン部の表示電極面積がドットマトリクス部の1ライン分の表示電極面積よりも大きく、流れる電流が大きくなる場合には、ドットマトリクス部への引き廻し電極24aの配線抵抗よりもアイコン部への引き廻し電極24bの配線抵抗が増加し、これによる電圧降下が大きくなってし

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まい、アイコン部に十分な電圧を印加できないという問題があったが、アイコン部への引き廻し電極24bについては、これを図3に示したように、導電性材料を含有するシール材26を介して、第1の基板の内側表面に設けられた電流バス増加用電極25と導電接触するよう構成することにより、引き廻し電極24の配線抵抗の増加を抑え、電圧降下を抑えることができ、アイコン部にも十分な電圧を印加することが可能となる。

【0033】

【実施例】

実施例

本発明の実施例として、片面に透明電極膜(表面抵抗 $300\Omega/\square$)が形成された2枚の透明なプラスチックフィルム基板(厚さ $150\mu\text{m}$)20、30を用意し、2枚のうちの1枚の基板20は、液晶表示素子のコモン側電極パターンとなるように、他の1枚30は液晶表示素子のセグメント側電極パターンとなるように公知のフォトリソグラフィ技術を用いてパターンニングした。そして、この液晶表示素子の表示部は、コモン側基板20とセグメント側基板30とを組み合わせたときに(重ね合わせたときに)、複数の帯状(ストライプ状)のコモン電極22の長手方向と複数の帯状(ストライプ状)のセグメント電極32の長手方向とがそれぞれ直交して対向するようにして、複数の方形の絵素となるドットマトリクス部と、セグメント電極とコモン電極の重なり部が文字や記号の形状となるアイコン部とから構成した。

【0034】この際、ドットマトリクス部へのコモン側電極パターンへの引き廻し電極は、セグメント側電極とは対向しない位置に配置した。また、アイコン部へのコモン側電極パターンへの引き廻し電極の一部分は、セル化後に外周シールとなる位置(シール材に沿った部分)に配置した。また、アイコン部へのコモン側電極パターンへの引き廻し電極の一部分と対向するセグメント側基板、すなわち、第1の基板30の表面には、他の引き廻し電極や表示電極とは独立した電流バス増加用電極パターン25を設けた。なお、この電流バス増加用電極パターン25は、図3に示したように、セル化後にコモン側引き廻し電極24と(シール材中に分散されている)導電性粒子を介して電氣的に接続されるものである(電流のバスを増やすことで実効的な配線抵抗を下げるために設けたものである)。

【0035】このように、各基板20、30に配線パターンを形成した後、各基板20、30に配向剤塗布、焼成、ラビング工程を施した。次いで、外部接続端子(外部引き出し用配線電極42、43)が設けられていない第2の基板(すなわち、複数のコモン側電極パターンが形成された基板)20には、この基板20を第1の基板(すなわち、複数のセグメント電極パターンと外部接続端子(外部引き出し用配線電極42、43)が設けられた基板)30と重ね合わせたときに、第1の基板30にお

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いて、外部接続端子(外部引き出し用配線電極42、43)が露出するように、対応する位置に矩形のプレカット穴を型刃で打ち抜いて形成した。そして、第2の基板20上に、所望のセルギャップを得るためのギャップ材35を散布した。

【0036】次いで、第1の基板30上に、セル化後に液晶表示素子の外周シールとなるシール材26をスクリーン印刷法により印刷した。ここで、シール材26中には、表面に金メッキを施した樹脂製の導電性粒子を分散させた。なお、シール材26中に導電性粒子を分散させるのは、第1の理由として、第2の基板20上に形成された引き廻し電極24と第1の基板30上に形成された外部引き出し用配線電極42とを、シール材26中の導電性粒子を介して電氣的に接続させるため(上下導通部を形成するため)である。これにより、すなわち、シール材26に導電性粒子を分散させたことで、図6に示したようにシール材26中に上下導通部(スルーホール)29を設けずに済む。

【0037】また、シール材26中に導電性粒子を分散させるのは、第1の理由として、第2の基板20上に形成された引き廻し電極24と第1の基板30上に形成された電流バス増加用電極パターン25とをシール部26中の導電性粒子を介して電氣的に接続させて電流バスを増加させるためである。

【0038】このようにして、第2の基板20上にギャップ材35を散布し、また、第1の基板30上に、導電性粒子を含有するシール材26を印刷した後、第2の基板20と第1の基板30とを重ね合わせ、重ね合わせた一対の基板20、30を表面が平滑なガラス板とシリコンゴム製の風船の間に挟み、風船にエアーを封入し、重ね合わせた基板を加圧した状態で加熱してシール材26を硬化した。

【0039】次いで、重ね合わせた一対の基板20、30を切断した後に液晶を封入し、複数の液晶表示素子を得た。こうして作製した液晶表示素子は、アイコン部への引き廻し電極の配線抵抗とドットマトリクス部への引き廻し電極の配線抵抗との違いによる表示濃度むら発生がなく、駆動電圧を印加したときの表示状態は良好であった。

【0040】比較例

比較例においても、上述の実施例と同様の方法で、表面抵抗 $300\Omega/\square$ の電極が形成された基板を用いて、液晶表示素子を作製したが、比較例では、上述の実施例における電流バス増加用電極パターン25は形成しなかった。このようにして作製した比較例の液晶表示素子は、アイコン部への引き廻し電極の配線抵抗が大きく、駆動電圧を印加したときにドットマトリクス部とアイコン部の表示濃度に明らかな違い(むら)が見られた。

【0041】

【発明の効果】以上に説明したように、請求項1乃至請

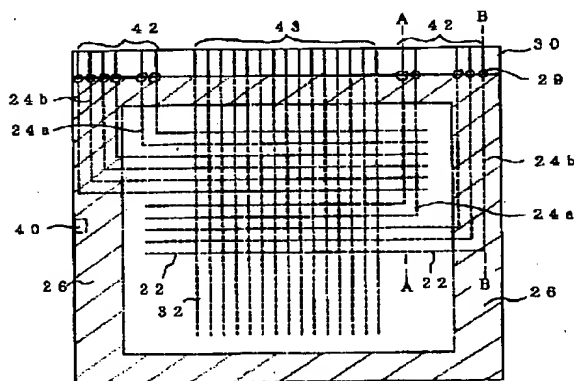
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求項3記載の発明によれば、内側表面にセグメント電極とセグメント電極用、コモン電極用の外部引き出し電極とを備えた第1の基板と、内側表面にコモン電極とコモン電極に電氣的に接続されるコモン電極用の引き廻し電極とを備えた第2の基板とを、シール材を介して接着し、第1の基板と第2の基板との間に液晶を挟み、対向するセグメント電極とコモン電極との間に印加される電圧によって透過光量を制御する液晶表示装置において、シール材には導電性材料が含有されており、また、引き廻し電極の少なくとも一部は、シール材が接着される第2の基板上の部分に沿って延び、また、第1の基板には、その内側表面において、第2の基板上の引き廻し電極の少なくとも一部に対向させて、シール材が接着される部分に電流バス増加用電極がさらに形成されており、第2の基板の内側表面に設けられたコモン電極の引き廻し電極の少なくとも一部は、導電性材料を含有するシール材を介して、第1の基板の内側表面に設けられた電流バス増加用電極と導電接触するよう構成されているので、シール材を介して電流バス増加用電極と導電接触する引き廻し電極については、その実効的な配線抵抗を低下させることができ、引き廻し電極自体に比較的大きな表面抵抗の電極を用いた場合でも配線抵抗の違いによる表示濃度むらの発生を有効に防止することができる。特に、電流バス増加用電極を設けることで、引き廻し電極のパターン幅を小さくしても、引き廻し電極のパターン幅が大きい場合と同程度の配線抵抗が得られ、従って、引き廻し電極のパターン幅を可能な限り小さくしてコンパクトな(小型の)液晶表示装置(液晶表示素子)を提供することができる。

【0042】また、請求項2記載の発明によれば、引き廻し電極パターンの一部をシール部内に設けるので、表示部から液晶表示素子の外形までのいわゆる周縁部分

【図1】



(額縁部分)を狭くできる。

【0043】また、請求項3記載の発明によれば、請求項1または請求項2記載の液晶表示装置において、第2の基板に形成されている引き廻し電極は、導電性材料を含有するシール材を介して、第1の基板に形成されている外部引き出し電極と電氣的に接続されるので、第2の基板上のコモン電極、引き廻し電極を第1の基板上の外部引き出し電極と電氣的に接続するのに、シール材中に従来のように上下導通孔を設ける必要がなくなる。

【図面の簡単な説明】

【図1】本発明に係る液晶表示装置の構成例を示す図である。

【図2】図1のA-A線における断面図である。

【図3】図1のB-B線における断面図である。

【図4】液晶表示素子(液晶表示装置)の一例を示す概略平面図である。

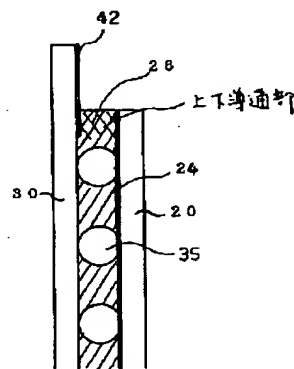
【図5】液晶表示素子(液晶表示装置)の一例を示す概略平面図である。

【図6】図5のB-B線における断面図である。

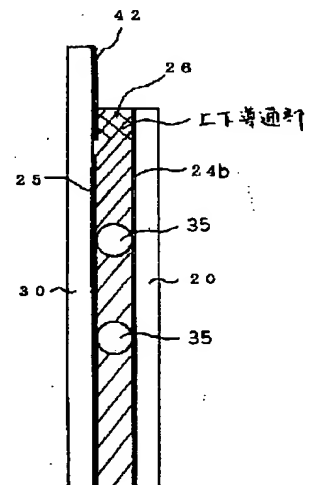
【符号の説明】

- | | |
|----|-------------|
| 20 | 第2の基板 |
| 22 | コモン電極 |
| 24 | 引き廻し電極 |
| 25 | 電流バス増加用電極 |
| 26 | シール材 |
| 29 | 上下導通部 |
| 30 | 第1の基板 |
| 32 | セグメント電極 |
| 35 | ギャップ材 |
| 42 | 外部引き出し用配線電極 |
| 43 | 外部引き出し用配線電極 |

【図2】

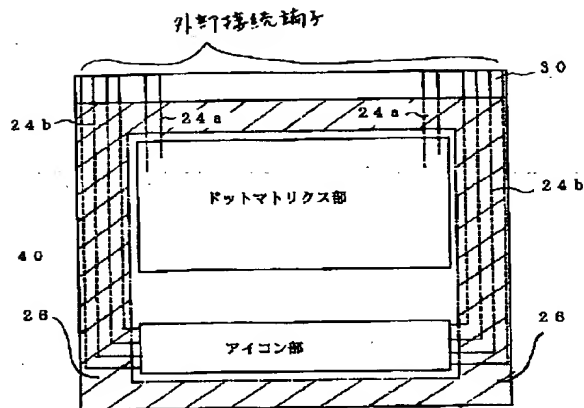


【図3】

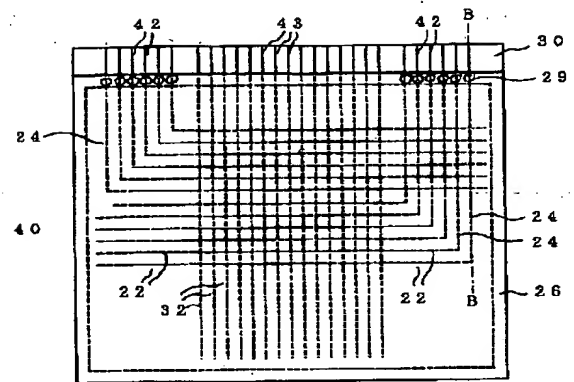


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【図4】



【図5】



【図6】

